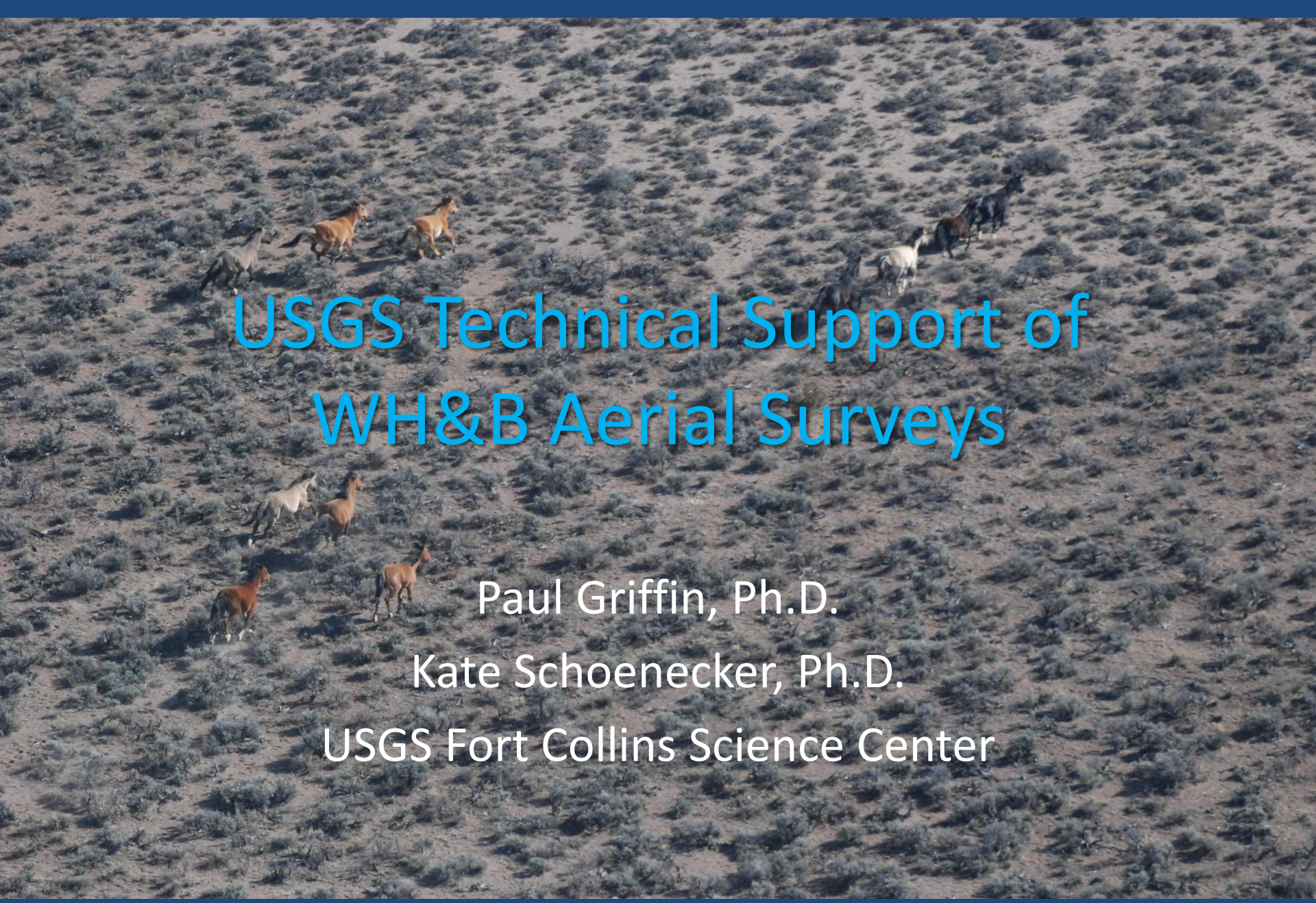


USGS Technical Support of WH&B Aerial Surveys

Paul Griffin, Ph.D.
Kate Schoenecker, Ph.D.
USGS Fort Collins Science Center

Aerial Survey Training, to date

Number of BLM WH&B specialists* trained in-flight (*or lead WH&B range conservation officers, or BLM state leads)	**20**
Number of WH&B specialists* trained, meetings only	4
Number of WH&B specialists* trained, webinar only	5
USFS range specialists trained: 5 in flight, 5 in classroom or webinar	

* Here, 'specialists' includes range conservation officers with lead duties for WH&B in their field office.

- People are only counted once here, even if they did 2 trainings.

- These numbers do not include 10 pilots, 32 other BLM staff and 6 other USFS staff that may help with surveys, aviation, or outreach.

as of April 10, 2015

USGS

Aerial Survey Assistance, FY2014

Number of HMAs surveyed with new methods (3 HMAs surveyed for horses were also repeated for burro surveys)	**67**
Number of USFS Wild Horse territories surveyed with new methods	15
Number of planning and analysis 'projects' all these surveys were grouped into	**17**
Number of these 'projects' for which USGS planned all flight paths in GIS	14
16 'projects' were analyzed, at least preliminarily; data are not yet received from the district for 1 'project.'	
Average time from receipt of data to results memo draft being sent to district	59 days Range = 4 – 196

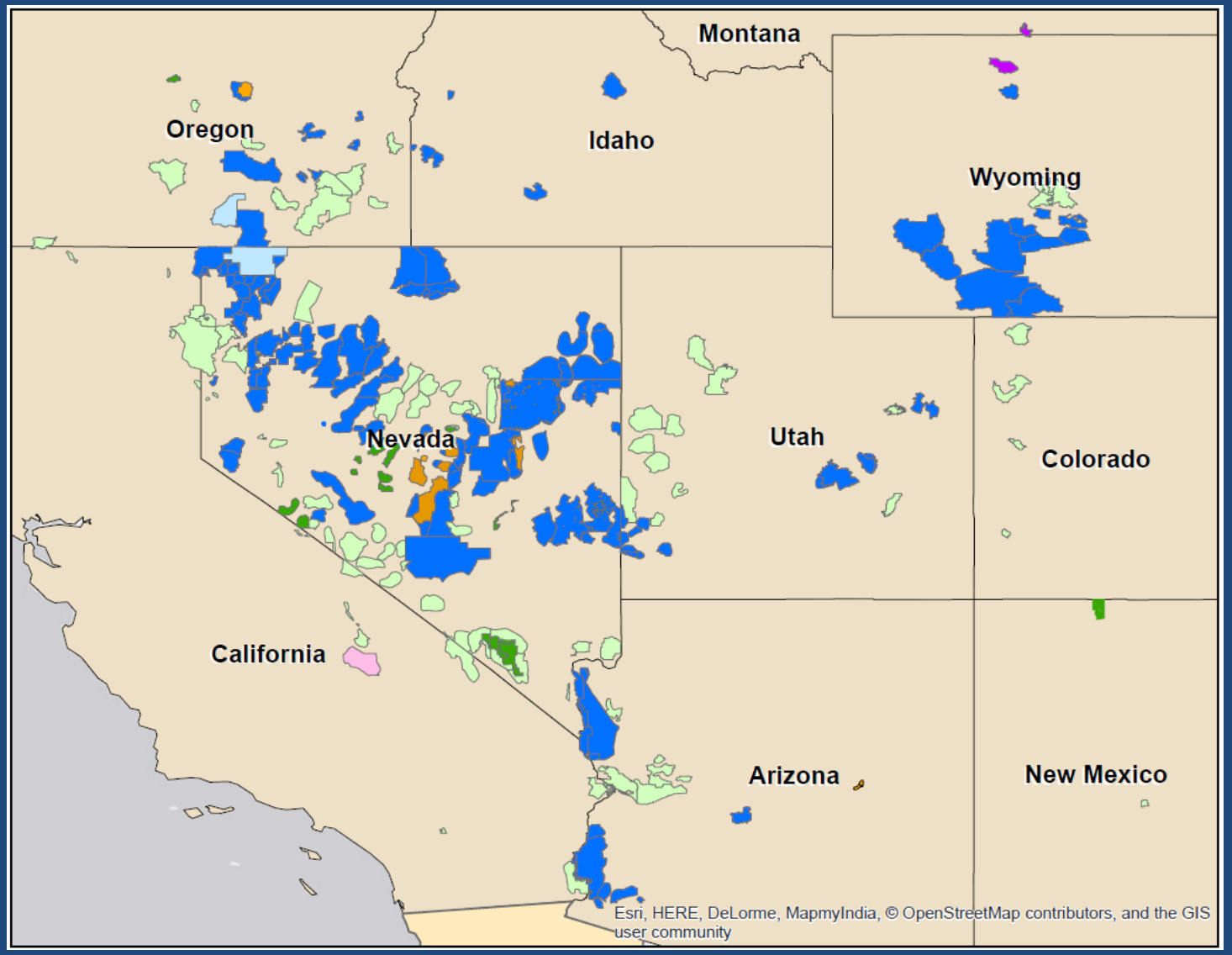
USGS

Aerial Survey Assistance, FY2015

Number of HMAs & HAs planned with new methods	**78**
Number of USFS Wild Horse Territories planned*	9
Number of planning and analysis 'projects' all these surveys will be grouped into	**19**
Number of these 'projects' with surveys completed, as of April 10, 2015	6

* The WHTs are Spring Mountain, Red Rock, Johnnie, Murderer's Creek, Heber, Jicarilla, Powell Mountain, Montgomery Pass, and White Mountain

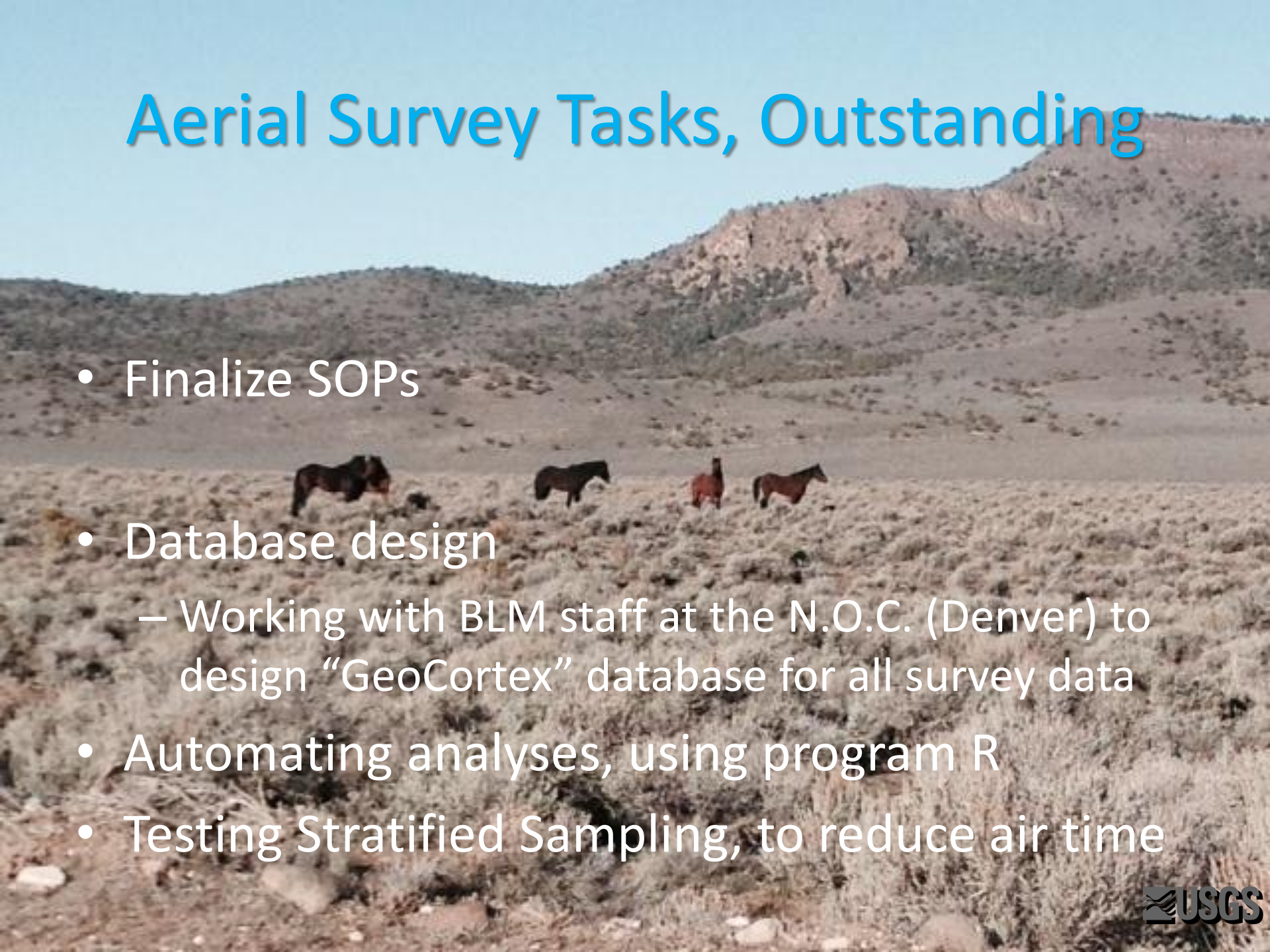
USGS



Wild Horse and Burro Surveys
February 2014 to April 15, 2015

- BLM, HMA or HA surveyed with new methods
- BLM, HMA surveyed with ground counts
- USFS, WHT surveyed with new methods
- US F&WS, Refuge surveyed with new methods
- BLM Herd Management Area (HMA), not surveyed
- USFS Wild Horse Territory (WHT), not surveyed
- DOD lands with incomplete WH&B survey

Aerial Survey Tasks, Outstanding



- Finalize SOPs
- Database design
  - Working with BLM staff at the N.O.C. (Denver) to design "GeoCortex" database for all survey data
- Automating analyses, using program R
- Testing Stratified Sampling, to reduce air time

USGS

Status of USGS Research for Wild Horses and Burros

Presentation to the Wild Horse and Burro Advisory Board

April 23, 2015

Kate Schoenecker, PhD

Outline

1. Research Team; who we are.
2. Status of ongoing research.
3. Proposals being developed at the request of BLM.

Research Team

USGS Researchers:

- Dr. Kate Schoenecker
- Dr. Sarah King (CSU)
- Dr. Paul Griffin
- Steve Germaine, MS
- Linda Zeigenfuss, MS
- Dr. Eric Beever
- Dr. Butch Roelle (*USGS Emeritus*)
- Dr. Zack Bowen (USGS Branch Chief)

Collaborators:

- Dr. Emily Kachergis (BLM)
- Dr. Randy Boone (CSU)
- Dr. Steve Jenkins (*UNV Emeritus*)
- Other CSU researchers in College of Natural Resources.

Partners:

- BLM State Leads and Wild Horse Specialists
- Staff at PV Adoption Facility
- BLM WO

USGS

Overview

Ongoing Research:

Problem statement: Each study was recommended by NAS report, or identified as a need by BLM.

1. Population estimation using Fecal DNA (non-invasive genetic diversity, population estimation, invasive species spread)
2. Radio marking/collaring
3. Carrying Capacity Modeling
4. Efficacy of SpayVac™ immuno-contraceptive

USGS

Estimating Wild Horse Population Size with Fecal DNA

- Noninvasive methods to study wildlife using DNA from hair and feces are increasingly being used by wildlife biologists.

USGS

Estimating Wild Horse Population Size with Fecal DNA

- Noninvasive methods do not require handling animals so are less stressful to horses.
- Other studies have demonstrated use with single sampling; some with citizen scientists or volunteers.
- Wilderness values and wilderness concerns have driven development of these new techniques.
- We proposed to test this for wild horses to provide non-aerial options to count horses; may be preferable to some WH specialists.

Estimating Wild Horse Population Size with Fecal DNA

- DNA in feces is the “mark” that identifies individual horses, then Mark-recapture models can be used to estimate population size.
- Population estimation from fecal DNA can potentially provide managers with a new tool that is defensible, accurate (this method accepted and used in wildlife for ≥10 years), less stressful to horses, and potentially less expensive than aerial surveys although not yet.
- Gain public engagement by using volunteers.

USGS

Estimating Wild Horse Population Size with Fecal DNA

- Samples will also used to determine genetic structure of the population (without needing to Gather and collect hair or blood).
- NAS report recommended investigating horse contribution to spread of invasive plants. We will use microhistology and plant DNA to evaluate.
- Research was conducted in a herd with known population size (Little Book Cliffs, CO).

USGS

Estimating Wild Horse Population Size with Fecal DNA

Status:

- Field work completed. Conducted three 10-day sampling periods with 5 volunteers, collected ~600 samples/sampling period.
- Dung aging study conducted monthly from May-Nov 2014.
- All samples currently at USGS lab for genetic analysis. Initial results very promising – even older samples amplifying well. Promising technique for determining genetic structure of a population as well.

USGS

Estimating Wild Horse Population Size with Fecal DNA

Status:

- Lab analyses for non native plant species DNA initiated in March, also initiated germination study. One year wait-time for microhistology.
- Very feasible in a moderate-sized area with few volunteers (≤5). Also, older dung does amplify.
- After lab analyses for genetics are completed, population estimation with mark-resight models will be conducted, with final results in late 2015.

Developing a Suitable Radio Collar for Wild Horses

USGS

Developing a Suitable Radio Collar for Wild Horses

- Telemetry collars have been used for > 30 years on ungulates, rarely on horses.
- Ability to mark and located individuals has application for habitat selection, movement ecology, population estimation (mark-resight), locating treated individuals (contracepted, e.g.), and other.
- Research using radio collars on ungulates has greatly advanced our understanding of their habitat use and ecology, and improved capacity for conservation.
- A study was conducted on Sheldon NWR and published in PLos One – collars developed for mares but not stallions.

USGS

Developing a Suitable Radio Collar for Wild Horses

Objectives:

1) Obtain a collar used in Sheldon study; test it against others.
2) Develop a custom collar; expansion and contraction focused. Pilot testing in summer 2013 indicated large neck position circumference differences.
3) Design a collar suitable for stallions.
4) Test alternatives to collars, such as radio tags in the mane and tail.
5) Primary objective to measure FIT and WEAR, and behavior of collared versus control individuals for one year.
6) Next step is field testing collars on free-roaming horses.
7) What we are NOT testing: long term efficacy (> 1 year); proportion of accidents or calamities --- this needs to be done in the wild. Accidents will occur.

USGS

Developing a Suitable Radio Collar for Wild Horses

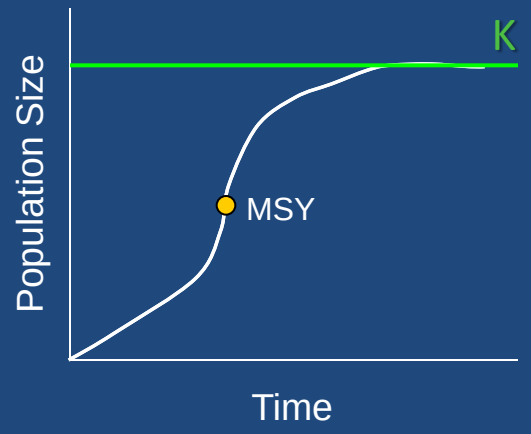
Status:

1) Worked with 6-7 vendors and selected 4 collar designs and 3 tags for testing.
2) Pre-tested collars and tags on domestic animals Sept-Dec, 2015.
3) Collars and tags were deployed at Pauls Valley, Oklahoma adoption facility in February 2015 on 12 mares, 12 stallions, and 4 jennies.
4) Collecting individual behavior compared to controls, monitoring fit and wear. Bring into chute 1x/month. Preliminary results in early June, 2015.

USGS

Carrying Capacity Modeling for Adaptation to Climate Change

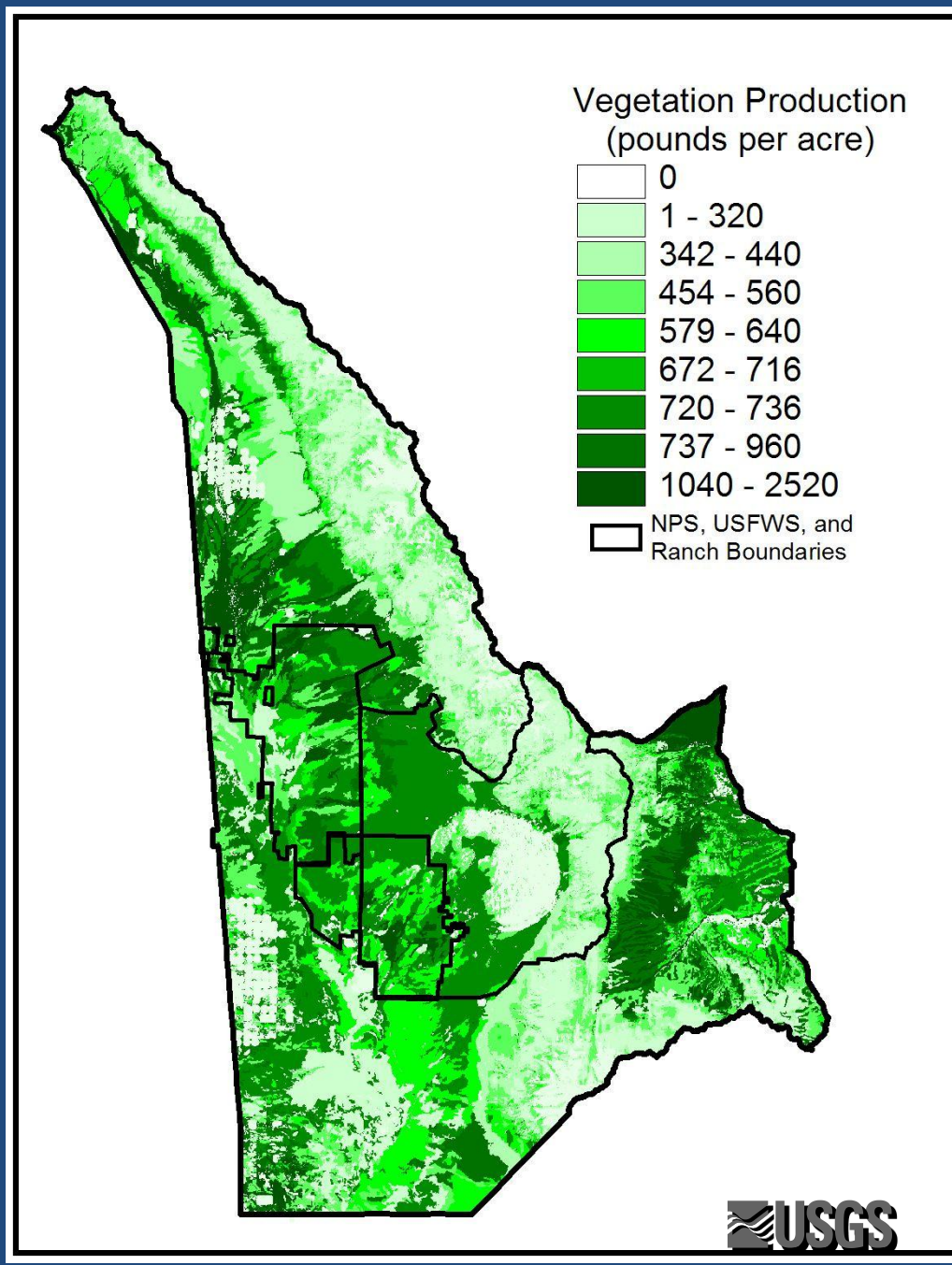
- Outcome of the NAS report.
- We proposed a coarse model evaluating changes in carrying capacity in response to changes in vegetation production.
- Can be done without detail demographic information; a mechanistic forage-based model not a population model.
- Follow methods of Wockner et al. (2014)



USGS

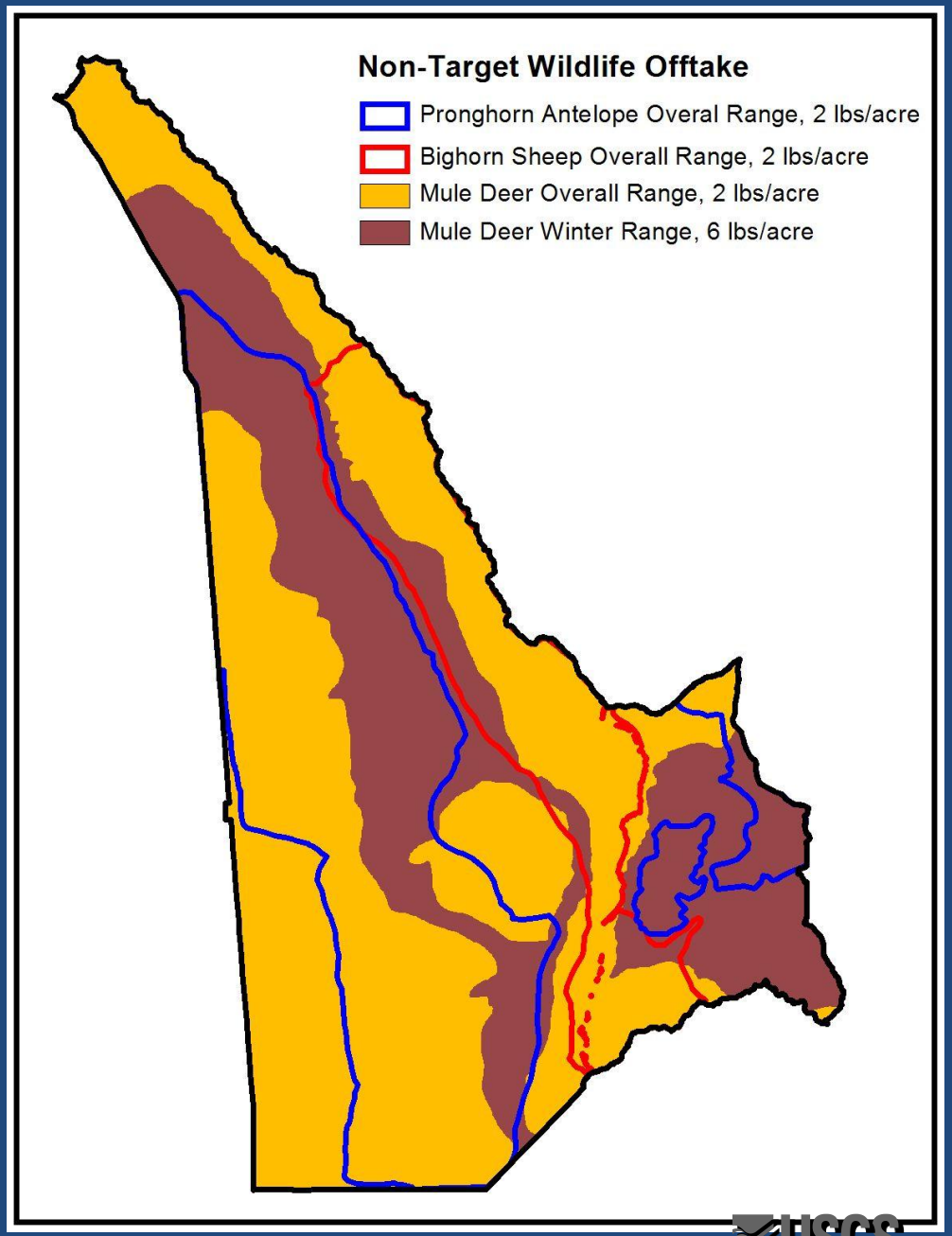
Methods

Start with base vegetation production map and calculate “Habitat Sustainability Index”, or the amount of vegetation production that must not be grazed.



Methods

- Subtract utilization from livestock, bison, and other wild ungulates – mule deer, pronghorn, and bighorn sheep.
- Calculate the amount of vegetation that remains on the range.



Carrying Capacity Modeling for Adaptation to Climate Change

Baseline Results Table

Estimated Carrying Capacity For Elk		
Elk Low Threshold	Elk Mid-point	Elk High Threshold
3,790	6,104	8,417

Results For a Climate Change Scenario that Results in 10% Less Forage Production

Estimated Carrying Capacity For Elk		
Elk Low Threshold	Elk Mid-point	Elk High Threshold
2,191	4,273	6,356

Use literature to determine climate predictions in specific habitat types.

USGS

Carrying Capacity Modeling for Adaptation to Climate Change

Status:

1) USGS approved proposal; pending BLM formal approval.
2) Non-invasive; met in March 2015 with collaborators (Emily Kachergis-BLM; Randy Boone-CSU)
3) Model building and testing in 2015.

Spay Vac

Status:

- 2015 will be the 4th foaling season for mares treated in 2011 and the 1st for mares treated in 2014
- Both groups were tested for pregnancy in February
- PZP-treated mares have sometimes had false positive estrone sulfate pregnancy tests
- Will verify status of both groups in April by palpation
- Will make decisions about future monitoring based on palpation results

Proposed Research

Overview

Proposals being developed at the request of BLM:

1. Burro Population Estimation Techniques.
2. Sentinel Demography of Burros.
3. Efficacy of Intrauterine devices (IUDs) in mares.
4. Evaluating behavior of spayed free-roaming mares.
5. Evaluating behavior and ecology of geldings among a breeding herd.
6. Sentinel demography of free-roaming wild horses.
7. WinEquus II (Population Modeling)
8. Testing efficacy of contraceptives in female burros.

USGS

Developing Burro Population Estimation Techniques

Objectives:

1. Test a hybrid double-observer sightability model for burros across their range.
2. Test modern aerial infrared in burro surveys.

USGS

Developing New Population Estimation Techniques for Burros

1. Hybrid model development and testing will need radio collared burros. The model will rely on observations from collared burros to account for the proportion of the population not seen by any observer. After a hybrid double-observer sightability model is developed across multiple habitat types (4-5 HMAs), it can be applied in other (all) HMAs.

USGS

Developing New Aerial Survey Techniques for Burros

2. Infrared surveys will use a contractor, with the latest IR cameras and sensors that pinpoint the location of detected animals. Aerial infrared surveys for burros may be combined with distance analysis to estimate population size.

Status:

- Proposal completed, in peer review.
- Time Frame: proposing to start surveys in fall 2015.
- Potential Study Sites: 3-4 burro HMAs in varied habitat types. Need 25-30 radio collared burros/HMA.

USGS

Sentinel Demography of Burros

- NAS committee recommendation; little known about burros.
- Proposing to conduct a more in-depth study on one of the herds used in the burro population estimation techniques study.
- Survival, fertility, fecundity, recruitment, movements, range use, habitat selection, and social behavior.
- Status: Developing proposal.

USGS

Intrauterine Device Study

Objectives:

- Evaluate the 1) efficacy and 2) unintended effects (chronic inflammation, infection) of O-ring IUDs made from silicone material.

Background:

One prior study (Daels and Hughes 1995) found O-ring IUDs effective in a sample of six mares during one breeding season. No other studies exist.

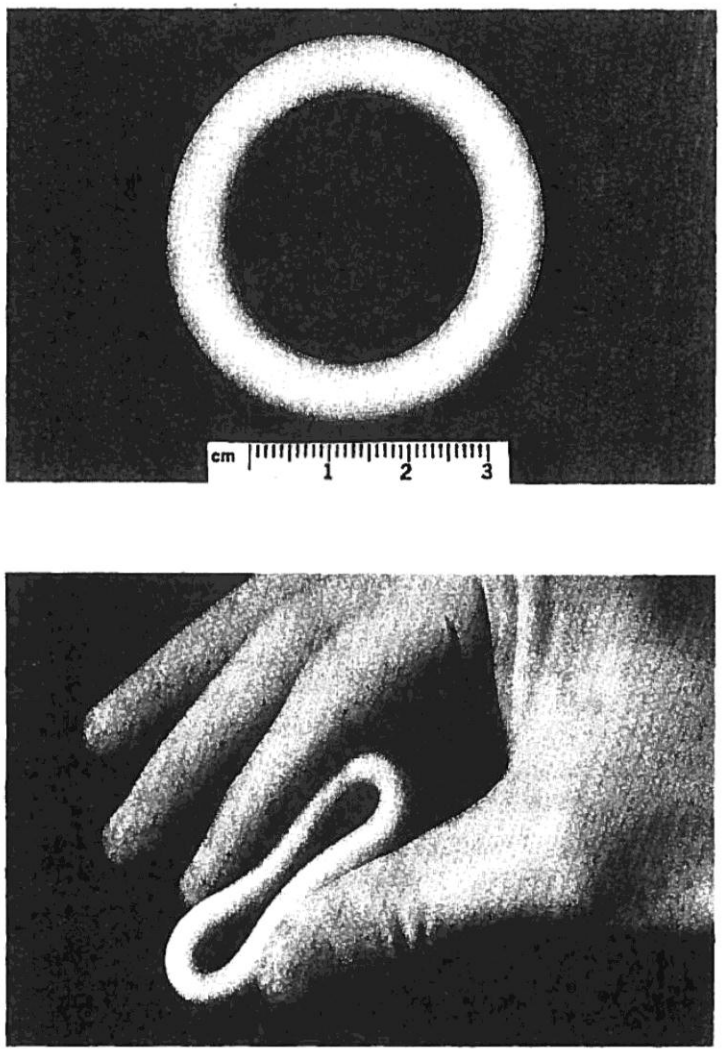


Figure 1. Photograph (top) of the type of IUD used in this study. The IUD could easily be collapsed between thumb and index finger as shown in the bottom photograph.

USGS

Intrauterine Device Study

- Study specifics (*proposed*)
  - Location: tbd
  - Study size and duration
    - 30 mares (15 treated; 15 control)
    - 3 IUD breeding seasons, 1 post- IUD breeding season
  - Start up
    - Logistics (approvals, purchasing mares) may dictate a start date of April 2016.

USGS

Evaluating Behavior of Spayed Free-Roaming Mares

- Development of population growth suppression tools.
- Study will focus on behavior, social interactions, body condition, movements, and trt related mortality of spayed mares versus controls.
- We will conduct modeling to guide decisions on number of animals treated.

- Track mares with radio collars, no yearlings collared but will include yearlings co-located with collared mares.
- Will measure population-level effect.
- Status: Developing proposal.

USGS

Behavior and Ecology of Geldings Among a Breeding Herd

- Development of population growth suppression tools.
- Study will focus on social behavior, movements, congregations, body condition, and habitat selection of gelded males.
- Track individuals with radio collars.
- Status: Developing proposal.

USGS

Sentinel Demography of Free-Roaming Wild Horses

- NAS Committee recommended.
- Will measure fertility, fecundity, recruitment, age-specific mortality and survival, habitat selection, home range, movement ecology.
- Status: Developing proposal.

WinEquus II

- Need: BLM managers need an improved tool to compare outcomes of population modeling scenarios. Currently, WinEquus can only evaluate one scenario (tool) at a time.

- The New Model: will project costs/benefits and population growth for various management alternatives including PZP, removals, spaying, gelding, other.
- New model will be best served with empirical data from Sentinel Demography research.
- Statement of Work developed with BLM input
- Collaborating with Dr. Steve Jenkins (U.NV-Reno, Emeritus) and Rebecca Moore (BLM Economist)
- Waiting for BLM approval of statement of work; will then proceed with proposal development.

USGS

Testing Efficacy of Contraceptives for Female Burros

- Recommended by NAS Committee Report
- Currently developing and discussing ideas
- Will be pen trial, followed by field study

Questions?